

- 6 -

language in other claims, is unclear. Without admitting that the claims were indefinite, the Applicants have amended claims 1 - 4, 5, 7- 10 and 27 - 30. Claims 7 - 10 depend on claim 5. Claims 31 to 33 do not have language similar to that in part (d) of claim 1. The Applicants submit that the amendments to the claims do not add any new subject matter. The Applicants further submit that the amended claims are not indefinite for the following reasons.

The matter at part (d) of claim 1, or the similar matter in other claims, is not a process step. (d) appears after a "whereas" clause and is a limitation on or modification of steps (a) through (c) rather than a new step. The amended claims no longer use lower case letters to name paragraphs after the "whereas" clause to make this distinction clear.

The claims have also been amended to use more terms from the specification and to restate the calculation which was embodied in part (d) of claim 1. In particular, the words "selected duration" have been replaced by "period of time" to correspond more directly with the use of "time" in the definition of "T" at page 11, line 3 to page 12, line 20. Further, the matter formerly in part (d) of claim 1 has been broken into two paragraphs. These two paragraphs use the words "cleaning event", "CT" and "weekly CT" which are described in the specification at page 11, line 3 to page 12, line 20. The claims now clearly describe a calculation for weekly CT which limits or modifies the cleaning events of steps (a) through (c).

Claim Rejections - 35 USC 102 and 103

The Office Action rejected claims 1-18 and 27-33 as being anticipated or obvious in view of columns 1 and 2 of Del Vecchio US 6,210,582. US 6,210,582 has been withdrawn, but US 6,331,251 has since issued based on the same application and having generally the same disclosure. Accordingly, the Applicants will address the claim rejections in view of the '251 patent.

D

- 7 -

Columns 1 and 2 of Del Vecchio '251 describe various prior patents or applications and conclude with two paragraphs of discussion on deficiencies in the prior art. The Applicants submit that none of this text anticipates the Applicants' claims or make them obvious. The Office Action submits that the descriptions of cleaning methods described in columns 1 and 2 of Del Vecchio could be validly combined with each other. The Applicants' submit that such a combination is not proper. Columns 1 and 2 do not suggest that the disclosures of these various prior patents or applications should be combined into a single device. Further, some are actually inconsistent with each other. For example, Smith '479 (column 1, lines 44 - 62) describes a cleaning method in which the membranes remain in a process tank which is not drained for cleaning while WO 97/18887 (column 2, lines 30-46) describes a method in which the membranes remain in a process tank which is emptied for cleaning.

The Applicants' further submit that, even if all the techniques disclosed in the summary were combined, the combination still would not anticipate the Appellants' claims or make them obvious. The following is a list of all of the techniques discussed in Del Vecchio columns 1 and 2,

- (a) cleaning membranes by recirculating a cleaning fluid through the lumens of the membranes at a low pressure not exceeding the bubble point;
- (b) membrane fibres kept awash in bubbles of a fibre cleansing gas;
- (c) backwashing the membranes with permeate;
- (d) pumping cleaning solution from a tank into the membranes;
- (e) emptying a membrane tank of effluent and then filling the tank with a cleaning solution through the pores of the membranes; and,
- (f) removing the membranes from their tank for a deep chemical cleaning.

The Applicants' submit that all of the techniques above, even if taken in combination, do not contain all of the elements of the Applicants' claims. In particular, the following

D

- 8 -

elements of the Applicant's claims, among others, are not disclosed: (a) performing cleaning events at least once a week (claims 1-4, 6-17 and 27-33), (b) a weekly CT within the claimed ranges (claims 1-4, 7-17 and 27-33), (c) a concentration, period of time and weekly CT selected to maintain a stable permeability or reduce the rate of decline in permeability of the membranes over extended periods of time (claims 1-4), (d) the extended periods of time being at least 15 days (claim 33), (e) flowing a chemical cleaner through the membranes in a direction opposite to the direction in which permeate passes through the membranes in repeated pulses of a selected pulse duration separated by waiting periods of a selected waiting period (claims 5 - 17) (f) a selected pulse duration and selected waiting period duration such that the chemical cleaner remains substantially effective during the waiting period despite decreasing in efficacy from an initial efficacy and is restored to the initial efficacy by the subsequent pulse (claims 5-17), (g) a length of pulse within the claimed ranges (claims 11-13), (h) a waiting period between pulses in the claimed ranges (claims 11-13), (i) the membranes not being agitated while the chemical cleaner is flowed through the membranes (claims 5, 31), (j) a pressure of pulse within the claimed range (claim 14), (k) a flow through the membranes during pulses within a claimed range (claim 15), (l) removing chemical cleaner from the tank before permeation begins (claim 17), (m) resuming permeation before resuming agitation as in claim 18, (n) the ranges of chemical cleaner concentration and time for the cleaning events described in claim 27, (o) the decrease in permeability being as stated in claim 33 read in combination with the cleaning events of claim 27 being at least once a week, (p) combining recovery cleanings with the cleanings of part (B) of claim 27 (claims 27-31 and 33) and (q) the outsides of the membranes remaining in fluid contact with the water containing solids in combination with the other elements of claims 5 or 27 (claims 5 and 31).

The Applicants' submit that the differences between their claims and Del Vecchio columns 1 and 2 are beyond what would have been obvious to one skilled in the art or what is conventionally known in the art.

- 9 -

Double Patenting

The Office Action provisionally rejected claims 1-18 and 27-31 on the basis of double patenting in view of Application No. 09/425,235. This was a provisional rejection and the Applicants will consider whether to file a terminal disclaimer if and when the '235 Application issues to patent. However, the Applicants' submit that as long as not allowance has been issued in the '253 application, this provisional rejection should not interfere with the allowance of the present case.

For the reasons given above, the Applicants submit that the application is in condition for allowance.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

Respectfully submitted,

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- 10 -

Appl. No. 09/425,234

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the claims:

Please amend claims 1 - 4, 5, 7 - 10 and 27 - 30 as follows:

1. (Amended three times) A method for cleaning one or more membranes normally immersed in water containing solids and used to produce a filtered permeate comprising:

~~performing at least once one or more cleaning events per a week, each cleaning event having the steps of:~~

(a) stopping permeation;

(b) flowing a ~~selected concentration of a~~ chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a ~~selected duration period of time;~~ and,

(c) resuming permeation,
wherein

~~(i) each of the one or more cleaning events has a CT which is equal to (A) the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy multiplied by (B) the period of time;~~

~~(ii) the one or more cleaning events have a weekly CT which is equal to the sum of the CT's of the one or more cleaning events performed in a week and the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide~~

- 11 -

~~chemical cleaner in an area in or adjacent the membranes for a selected duration in a week is between 2,000 minutes•mg/L and 30,000 minutes•mg/L; and,~~

~~(e) (iii) wherein the selected concentration, selected duration period of time and sum of the products weekly CT are selected to maintain a stable permeability or reduce the rate of decline in permeability of the membranes over extended periods of time.~~

2. (twice amended) The method of claim 1 wherein the ~~sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration in a week~~ weekly CT is between 2,000 minutes•mg/L and 20,000 minutes•mg/L.

3. (twice amended) The method of claim 1 wherein the permeate is intended for drinking water and the ~~sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration in a week~~ weekly CT is between 5,000 minutes•mg/L and 10,000 minutes•mg/L.

4. (twice amended) The method of claim 1 wherein the water containing solids is a wastewater and the ~~sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the~~

D

- 12 -

~~membranes for a selected duration in a week~~ weekly CT is between 10,000 minutes•mg/L and 30,000 minutes•mg/L.

5. (twice amended) A method for cleaning one or more membranes normally immersed in ~~a water rich in~~ containing solids in a tank and used to produce a filtered permeate ~~a water lean in solids~~ comprising:

performing cleaning events having the steps of:

(a) stopping permeation;

(b) flowing ~~a selected concentration of a~~ chemical cleaner through the membranes in a direction opposite to the direction in which permeate passes through the membranes in repeated pulses of a selected pulse duration separated by waiting periods of a selected waiting period duration, ~~the repeated pulses and waiting periods in a cleaning event cumulatively having a selected duration~~ for a period of time; and,

(c) resuming permeation;

wherein

(d) the membranes remain immersed in the water containing solids while the chemical cleaner flows through the membranes;

(e) the outside of the membranes is in fluid communication with the water containing solids;

(f) the selected pulse duration and selected waiting period duration is such that the chemical cleaner remains substantially effective during the waiting period despite decreasing in efficacy from an initial efficacy and is restored to the initial efficacy by the subsequent pulse; and,

(g) the membranes are not agitated while the chemical cleaner is flowed through the membranes.

7. (twice amended) The method of claim 6 wherein ~~the sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of~~

- 13 -

~~NaOCl in cleaning efficacy and the durations of all of the steps (b) in a week is between 2,000 minutes•mg/L and 30,000 minutes•mg/L.~~

(i) each cleaning event has a CT which is equal to (A) the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy multiplied by (B) the period of time; and

(ii) the cleaning events have a weekly CT which is equal to the sum of the CT's of the one or more cleaning events performed in a week and is between 2,000 minutes•mg/L and 30,000 minutes•mg/L;

8. (twice amended) The method of claim 7 wherein the ~~sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps (b) in a week~~ weekly CT is between 2,000 minutes•mg/L and 20,000 minutes•mg/L.

9. (twice amended) The method of claim 6 wherein the permeate is intended for drinking water and the ~~sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps (b) in a week~~ weekly CT is between 5,000 minutes•mg/L and 10,000 minutes•mg/L.

10. (twice amended) The method of claim 6 wherein the water containing solids is a wastewater and the ~~sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps (b) in a week~~ weekly CT is between 10,000 minutes•mg/L and 30,000 minutes•mg/L.

27. (twice amended) A method for cleaning one or more membranes normally immersed in water containing solids and used to produce a filtered permeate comprising:

- 14 -

(A) performing recovery cleanings of the membranes from time to time, the recovery cleanings being at least 15 days apart from each other; and,

(B) between recovery cleanings, performing cleaning events at least once a week, the cleaning events each having the steps of:

(a) stopping permeation;

(b) flowing ~~a selected concentration of~~ a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a ~~selected duration period of time~~; and,

(c) resuming permeation,

wherein

~~(d) (i) the selected concentration of chemical cleaner is in each cleaning event has a concentration between about 20 mg/L and about 200 mg/L of chemical cleaner when expressed as an equivalent concentration of NaOCl in cleaning efficacy;~~

~~(e) (ii) the selected duration period of time of each cleaning event is between about 10 minutes and about 100 minutes; and,~~

~~(f) the sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration in a week is between 2,000 minutes•mg/L and 30,000 minutes•mg/L.~~

(iii) each of the one or more cleaning events has a CT which is equal to (A) the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy multiplied by (B) the period of time; and,

(iv) the sum of the CT's of the one or more cleaning events performed in a week is between 2,000 minutes•mg/L and 30,000 minutes•mg/L.

- 15 -

28. (as amended) The method of claim 27 wherein the sum of the ~~products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration in a week~~ weekly CT is between 2,000 minutes•mg/L and 20,000 minutes•mg/L.

29. (as amended) The method of claim 27 wherein the permeate is intended for drinking water and the ~~sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration in a week~~ weekly CT is between 5,000 minutes•mg/L and 10,000 minutes•mg/L.

30. (as amended) The method of claim 27 wherein the water containing solids is a wastewater and the ~~sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration in a week~~ weekly CT is between 10,000 minutes•mg/L and 30,000 minutes•mg/L.

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